This was not difficult, as the ground was dry when the snowfall began, and there was no crust or ice layer at the bottom of the layer of snow.

The measurements of evaporation indicate an average monthly evaporation of about 1 inch per month for fairly cold weather without heavy winds, with air usually clear.

551.509.3(315.17)

DAILY SYNOPTIC CHARTS OF THE NORTHERN HEMISPHERE AND ABSOLUTE UNITS.

[From Nature, London, Feb. 26, 1914, v. 92, pp. 715-716.]

On January 1 of this year, as already mentioned in the "Notes" of the issue of Nature for February 5, the Weather Bureau of the United States commenced the issue of a daily weather map of the Northern Hemisphere, compiled from observations received daily at Washington by telegraph.

In addition to the regular reports from the United States and Canada, represented in the well-known daily weather map of the bureau, reports are obtained from upward of 40 stations, which are sufficiently distributed in latitude and longitude to form the basis of a chart of isobars and isotherms for the Northern Hemisphere. The information is given on the back of the daily bulletin, and the Weather Bureau is to be congratulated upon being the first to publish a map showing the distribution of pressure and temperature over a hemisphere *on the day of issue.*

It rests with the bureau or with some still more enterprising institute, if there be one, to add the available observations from the Southern Hemisphere and realize what everyone who thinks about the subject knows to be the most sure basis for the study of the daily weather, viz, a daily map of the main features of the distribution of pressure and temperature over the globe.

Practically no lines are drawn on these maps for latitudes lower than 25°, and it is interesting to speculate as to what sort of characteristics a synoptic chart of the equatorial regions would show if it could be drawn. North of 25° the rotation of the earth makes it possible for pressure differences represented by "parallel isobars" to be sufficiently permanent to be charted, while ordinary centrifugal action makes "circular" isobars also equally possible. Hence on a chart for temperate and polar regions, isobars may take any shape between the small circle of a cyclonic depression and the great circle of "straight" isobars; but in the equatorial region there is no place for "parallel isobars," as they are understood farther north, because the influence of the rotation of the earth is too feeble; the winds required to balance isobars such as those to which we are accustomed would be prodigious. Consequently a pressure distribution sufficiently permanent to be mapped could only be made up of "circular" isobars, and therefore a chart of isobars for part of the equatorial region ought to be a collection of small circles with whatever may be necessary to represent the diurnal variation. It would be interesting to have this conclusion verified, and the transition between the region of circular isobars and the region of straight isobars carefully explored.

Variations of pressure, small in magnitude, but associated with weather changes, are shown as irregularities in the course of the well-known diurnal variation on barograms for equatorial regions and the translation of a collection of barograms into synoptic charts is an attractive problem. It would presumably tell us what the meteorological conditions would be if the earth were fixed and the sun went round it in 24 hours, as the ancients used to suppose.

One of the striking features of the maps now issued by the Weather Bureau is that for the first time in the history of official meteorological institutions C. G. S. units of pressure and the absolute scale of temperature are used for a daily issue of charts. The isobars are figured for every 5 millibars and the isotherms for every 10° or 5° on the centigrade scale measured from 273° below the freezing point of water.

This is indeed a remarkable step toward the unification of the methods of expressing pressure over the globe, and it has been immediately followed by the Meteorological Office in the corresponding charts which are published in the weekly weather report. The Office figures the centibars while the Bureau figures the millibars, but that is only a matter of decimal point.

Millibars are in future to be used, though not exclusively, for the international publication of the results of the investigation of the upper air, so that while it now seems likely that before many years are passed we may see a daily synchronous chart for the globe and really begin to study weather as it ought to be studied, we may at the same time expect to take leave of the inch and the millimeter as measures of pressure. They certainly have had a very long innings on a side to which they did not properly belong, and it will be interesting to see how the more scientific measure of pressure in in pressure units will adapt itself to practical requirements. The Meteorological Office is to make use of C. G. S. units of pressure for the Daily Weather Report on May 1 of the current year, and the preparations for that event have already placed some well-known facts in a curious light. The task which during the last 60 years we have been setting to British instrument makers is as follows: "Construct a barometer which will give a true pressure reading when the whole instrument is in latitude 45°, the mercury at 273° A., and its brass case at 290° A." Continental makers have had a problem that sounds simpler, viz, to construct a barometer which will give a true pressure reading when the instrument and its case are in latitude 45° at 273° A. The figures show that if instrument makers were to make a barometer which was correct at the equator at the freezing point of water, it would be correct in latitude 45° at the ordinary air temperature of 289° A. (61° F.) and at the poles at 305° A (89.6° F.). So for each latitude there would be a temperature within the common range for which the readings were true pressures. At other temperatures of course a correction would be required.—W. N. S[HAW].

551.482(714)(27)

THE JAPAN CURRENT AND THE CLIMATE OF CALIFORNIA.

The Editor receives so many inquiries in regard to the Japan Current and the Gulf Stream that the readers of the REVIEW will doubtless be interested in the following extracts from a well-considered article by William G. Reed, Ph. D., of the University of California, published in the Sierra Educational News, November, 1913, and the Journal of Geography, March, 1914:

The supposed relation between the climate of California and the Japan Current appears in the newspapers from time to time. In some way, not clearly stated, this current is held to have a profound effect upon the climate of the State. The Japan Current is an ocean stream of considerable interest and importance, but it is not a great factor in the climatic conditions of California. * * *

The Japan Current is, properly, that part of the drift which is warmer than the surrounding ocean; it is a warm current. As such it has its

beginning in the Pacific Ocean southeast of Japan, where the drift turns from a westerly to a northerly course, and flows to the north and then to the northeast to the Gulf of Alaska, where it divides into two branches, one continuing as a warm current through the Aleutian Islands and the other turning to the south to become the somewhat indefinite California Current. The California Current flows southward at some little distance from the western coast of the United States, and the water which has left the Tropics as the Japan Current is replaced by the California Current, so that the tropical ocean may not be losing water continually to the Alaskan region without adequate return to keep the amount of water in each place constant.

Near the coast of California the water is decidedly colder than it is in the open ocean, but as this coast strip has a lower temperature in the vicinity of Cape Mendocino than it has either north or south of this point, the cold strip must be the result of an upwelling of cold water from the depths of the ocean and not the result of an ocean current. The reports of vessels show that the movement of the surface of the ocean near the shore is irregular, but that farther out there is a general movement toward the Equator.

The facts of observation show that the Japan Current does not come within 900 miles of any part of California, and consequently can have little influence upon the climate of the State. But it is a fact that the climate of California is much milder than that of the greater part of the United States. The explanation is to be found in the great ocean which lies to the west and in the fact that the winds prevailingly blow from this ocean to the land. The temperature of the ocean water varies little from 55° during the year; in some places it is more and in some places less, but it is everywhere relatively constant through the year. The air lying over this great body of water has nearly the same temperature as the water, but were it not for the westerly winds, the climate of California would be little influenced by the ocean.

Compared with the land areas in the same latitudes the oceans have very mild climates. Everywhere the oceans are warm in winter and cool in summer because water is, of all the substances we know, among the most difficult to heat and to cool. The result is that the temperatures of the ocean and the air over the ocean remain nearly constant. But land is about twice as easy to heat and twice as easy to cool as is water, so that the land and the air over it have warm summers and cold winters, warm days and cool nights.

The fact that the winds blow from the ocean to the land is of the greatest importance to California. It is these winds which bring the mild ocean air over the land and give to this State a climate cooler in summer and warmer in winter than that of other parts of the country. The Pacific Ocean and the westerly winds from the ocean can and do produce all the beneficial results that have been claimed for the Japan Current, and it is to these two features of nature that we owe our mild climate. Whatever effect the Japan Current may have upon the Gulf of Alaska and upon the climate of the Territory of Alaska, and there is no doubt that this effect is very important, the State of California owes nothing to this warm current. The cool summers in the coast region of the State and the fogs which occur during that season are, in part, due to the presence of the cold water off the coast, and that part of the North Pacific drift known as the California Current may be one of the reasons for the existence of this cold water, although a far more important reason seems to be the upwelling of the cold water from the ocean depths. It is the Pacific Ocean and the westerly winds to which we must look for the chief reasons why the climate of the Golden State is favored above that of other lands.

MILD WINTER OF 1913-14.

AN UNUSUAL PHENOMENON.

Dr. Louis Bell writes from Boston, U. S. A., to describe an unusual meteorological phenomenon observed there last month. On January 13, which was the coldest day known in Boston for many years, the thermometer not ranging above 0° F. for a period of 30 hours extending through the entire day, Dr. Bell, upon entering a large train shed some 75 feet high and of a very extensive area, found that snow was steadily falling, produced by the congelation of the steam from the numerous locomotives. The interesting point was that the snow had aggregated into flakes of fair size, not distinctly crystalline, but still flakes, in spite of the short distance of the possible fall. The thermometer was then about 5° F. below zero, and in the evening at a similar temperature the whole interior of the train shed was still white with this deposit of snow. The general phenomenon, of course, has been many times recorded, but is very rarely seen, particularly on so large a scale and for so long a time.

WINTER OF 1913–14.

The exceptionally mild character of the present winter is being maintained until its close, and for a persistent continuance of warm days in January and February it surpasses all previous records. At Greenwich the thermometer in the screen was above 50° for 18 consecutive days from January 20 to February 15. Previous records since 1841 have no longer period than 11 days, in the months of January and February combined, with the thermometer continuously above 50°, and there are only four such periods—1846, January 21–31; 1849, January 16–26; 1856, February 6–16; and 1873, January 4–14. Besides these there are only three years, 1850, 1869, and 1877, with a consecutive period of 10 days in January and February with the temperature above 50°. The persistent continuance of the absence of frost is also very nearly a record. To February 24 there have been 30 consecutive days at Greenwich without frost in the screen, and the only years with a longer continuous period in January and February are 1867, with 37 days; 1872, with 43 days; and 1884, with 32 days. The maximum temperatures in the two months have seldom been surpassed. In many respects there is a resemblance between the weather this winter and that in 1899, when in February blizzards and snowstorms were severe on the other [American] side of the Atlantic, with tremendous windstorms in the open ocean, whilst on this side of the Atlantic the weather was exceptionally mild. It is to be hoped that this year we shall be spared the somewhat sharp frosts experienced in the spring of 1899. (Nature, London, Feb. 26, 1914, v. 92, p. 720–721.)

ON THE AMOUNT OF EVAPORATION.[1]

By Y. HORIGUTI.

[Dated Kobe Meteorological Observatory, January, 1913.]

(1) In the present note I intend to give some results of my investigation of the evaporation of water in an atmometer that is freely exposed to wind and sunshine.

This apparatus is a cylindrical copper vessel 20 centimeters in diameter and 10 centimeters deep. It is placed on the surface of ground that is covered with sod. Fresh water is poured in it to the depth of 2 centimeters and is freely exposed to sunshine and wind.

Every morning at 10 o'clock the amount of evaporation is determined by measuring the loss of water during the exposure. When rain or snow has fallen during the exposure the measured evaporation is corrected for the amount of precipitation shown by the rain gage placed near and at the same height with the atmometer.

First let us investigate theoretically the relation of evaporation and other meteorological elements.

(2) Suppose the case when the vaporizing water is not exposed to wind and direct sunshine, and is unhindered. Moreover, let us assume that the cylindrical vessel is so large that the effect of the surface tension at its periphery may be neglected.

Let the z-axis be vertical. Let p be the partial vapor pressure, then the upward force is $\frac{\partial p}{\partial z}$. The gravity and the resistance of air act downward.

[1] Revised reprint from Journal of the Met. Soc. of Japan, May, 1913, 32d year, No. 5, pp. 14–26.